

SOIL SURVEY OF THE BILOXI AREA, MISSISSIPPI.

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LOCATION AND BOUNDARIES OF THE AREA.

Harrison County is the middle Gulf coast county of Mississippi, and is bounded on the north by Perry County, on the east by Jackson County, on the south by Mississippi Sound—an arm of the Gulf of Mexico—and on the west by Pearl River and Hancock counties.

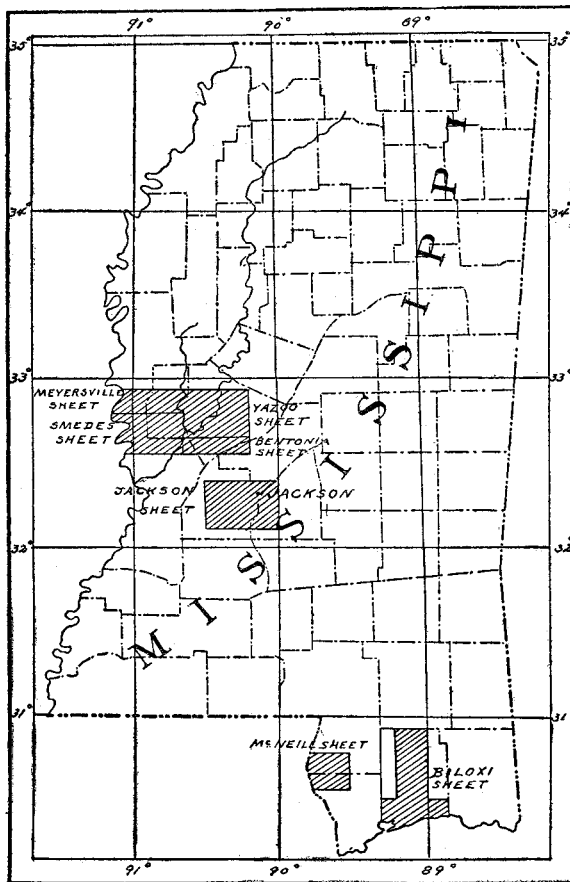


FIG. 14.—Sketch map showing location of the Biloxi area, Mississippi.

The area surveyed is T-shaped, and comprises about two-thirds of the county (393,920 acres, or about 615 square miles). It includes a strip across the southern part of the county, ranging in width from

8½ miles on the eastern side to 15 miles on its western border, and with a length east and west of about 27 miles; and also two tiers of townships lying in the central part of the county and extending north to the Perry County line. The area is included between the parallels of 30° 15' and 30° 55' north latitude, and the meridians of 88° 46' and 89° 16' west longitude.

Biloxi, situated in the extreme southeastern part of the area, is a summer and winter resort and the largest town within the area, while Gulfport is the county seat and is growing rapidly. Pass Christian is also a summer and winter resort. McHenry, Wiggins, Bond, Lyman, Howison, and Saucier are the principal lumber towns in the interior of the county, while Longbeach, situated on the coast, is now the center of the trucking industry of the area.

HISTORY OF SETTLEMENT AND AGRICULTURAL DEVELOPMENT.

Hancock County was formed in 1812, and about 1840 a division was made, the eastern part being organized as Harrison County, with the county seat at Mississippi City, where it remained until the autumn of 1903, and was then removed to Gulfport. Other early settlements were located at Wool Market and Pass Christian. The attention of the early settlers, as well as of a large number of the present inhabitants, was given to fishing and the catching of oysters, both being excellent along the coast and in the estuaries of the Gulf. Although two centuries have passed since the settlement of d'Iberville, very little agricultural development has taken place. In the interior of the county some very old settlements are seen; yet only small areas have been cleared, and the owners grow no crops except for home use. Corn, oats, and similar crops are grown, but only to a limited extent. About 1840 some Sea Island cotton was grown in the vicinity of the Bay of Portage with a fair degree of success, but owing to the difficulty of ginning this industry did not become established. Some cotton has been grown in the interior of the county, but the low yield has prevented the planting of a large acreage.

The open range and mild climate have contributed to the success of stock raising, the chief agricultural source of income in the interior. Formerly considerable quantities of wool were marketed and shipped by schooner from Wool Market, this giving the settlement its name. A large portion of the wool shipped from this point was produced to the north and northwest of the county, and the building of the New Orleans and Northeastern Railroad in 1871 diverted the shipping to points along that road. Recently considerable attention has been given to the growing of truck along the coast.

Until the Louisville and Nashville Railroad was built, in the early seventies, no transportation was afforded the products of the county except by schooner to New Orleans and Mobile.

The interior of the county was formerly one vast forest of long-leaf pine. Since the completion, in 1897, of the Gulf and Ship Island Railroad from Gulfport to Hattiesburg many large saw-mills have been built along its line, towns have been started, and the population has been considerably increased. Scarcely any attention, however, is given to agricultural pursuits, vegetables from other States being shipped into the area and sold in these sawmill towns at fancy prices. The people, as a class, are engaged in the production of lumber, charcoal, and turpentine, all of which are shipped from Gulfport.

CLIMATE.

The climate of the Biloxi area is that of the warm temperate zone. Bordering the Gulf of Mexico the climate is tempered by that great body of water, thus giving a more uniform temperature than is found farther north in the State.

The records of the Weather Bureau stations at Biloxi, Bay St. Louis, and Hattiesburg represent fairly well the climatological conditions in the area. Bay St. Louis lies near the coast, just west of the area surveyed, while Hattiesburg is about 25 miles north of the area. Two tables are presented, one showing the normal monthly and annual temperature and precipitation, and the other the dates of the last killing frost in spring and the first in fall. The hottest months are June, July, and August, with an average temperature of about 81° F. along the coast and 83° F. through the interior of the county. The coolest months are December, January, and February, with an average temperature of 51° F.

Normal monthly and annual temperature and precipitation.

Month.	Biloxi.		Bay St. Louis.		Hattiesburg.	
	Temper- ature.	Precipi- tation.	Temper- ature.	Precipi- tation.	Temper- ature.	Precipi- tation.
	° F.	Inches.	° F.	Inches.	° F.	Inches.
January	50.9	4.08	50.3	6.14	49.6	4.31
February	52.7	6.51	53.1	5.38	52.4	4.85
March	61.1	6.86	61.4	5.49	61.0	3.51
April	67.1	3.94	67.2	7.09	66.3	3.58
May	75.1	3.28	75.2	2.05	74.4	2.21
June	80.0	7.96	82.1	7.28	81.1	5.81
July	81.8	5.53	81.5	6.48	82.1	6.28
August	81.0	7.97	81.1	8.31	81.9	5.27
September	77.3	6.70	78.8	4.54	77.8	2.21
October	68.2	3.47	69.1	2.52	67.1	1.42
November	58.5	2.99	59.7	2.98	57.7	3.08
December	51.3	4.88	51.8	4.98	51.9	4.28
Year	67.1	64.17	67.6	63.24	66.9	46.81

Dates of first and last killing frosts.

Year.	Biloxi.		Bay St. Louis.		Hattiesburg.	
	Last in spring.	First in fall.	Last in spring.	First in fall.	Last in spring.	First in fall.
1894	Mar. 26	Dec. 26	Mar. 27	Dec. 27	Mar. 30	Nov. 12
1895	Mar. 2	Nov. 26	Mar. 3	Dec. 4	Mar. 21	.....
1896	Feb. 21	Nov. 30	Feb. 18	Dec. 25	.....	.....
1897	Jan. 29	Dec. 4	Feb. 2	Dec. 5	Feb. 28	Nov. 30
1898	Mar. 4	Oct. 22	Feb. 22	Nov. 23	Feb. 23	Oct. 27
1899	Feb. 13	Dec. 14	Mar. 7	Dec. 16	Mar. 7	Nov. 3
1900	Feb. 18	Nov. 13	Feb. 19	Nov. 13	Mar. 17	.....
1901 .....	.....	Nov. 17	Mar. 16	Nov. 17	.....	Nov. 16
1902	Mar. 6	.....	.....	Dec. 5	Mar. 6	Nov. 28
1903	Feb. 18	Nov. 19	.....	Nov. 19	Feb. 24	Oct. 25
Average	Feb. 24	Nov. 26	Feb. 28	Dec. 3	Mar. 9	Nov. 11

The rainfall is abundant, averaging near the Gulf about 63 inches annually, and somewhat less in the northern part of the area, judging from the records at Hattiesburg, where the normal precipitation is almost 47 inches. The rainfall is fairly well distributed throughout the year, and crops seldom suffer seriously from drought during the spring and early summer. The relative humidity, as well as the rainfall, is greater along the coast than in the northern part of the county.

In 1899 there occurred a period of unusually cold weather. The few orange trees in the area and many fig trees were killed. The latter have grown up again and are bearing fruit, but oranges are no longer grown on a commercial scale. As a general thing the winters are so mild that all kinds of farm labor can be carried on throughout that season. Many vegetables can be grown during the winter, while all kinds of truck are successfully produced in the late winter and early spring, and put on the market just after the Florida, Louisiana, and southern Texas crops. Cattle find good grazing from February to December, and many throughout the year have no feed except what they get from the range. Sheep are also raised at little or no expense to their owners. Poultry raising can be carried on successfully during the entire year.

On account of the mild climate many northern people spend the winter months here, while a number of New Orleans residents have summer homes along the coast.

PHYSIOGRAPHY AND GEOLOGY.

That portion of Harrison County included in the present survey lies within the Gulf Coastal Plain. The drainage of the area is accomplished by four separate systems. The Red River, a branch of

the Pascagoula, flows across the northern part of the area in a southeasterly direction. It has cut so deep a channel that the smaller streams flowing into it can easily carry off any excess of precipitation. A little farther to the south the Big Biloxi and Little Biloxi rivers extend across the area in a similar direction and unite about 2½ miles above Wool Market, forming Oakchambula Bayou, an arm of the Back Bay of Biloxi. In the southwestern part of the area is the Wolf River, which flows southeast until about 5 miles from the coast, where it turns sharply to the southwest and empties into the Bay of St. Louis. In the southeast Cabawfa Creek flows southeast and empties into the Tchula River at a point near the Jackson County line. From here the Tchula flows west and empties into the Back Bay of Biloxi near the mouth of Oakchambula Bayou. Except along their lower courses, where they reach the level of tide water, all of these last three systems, with their tributaries, have sufficiently rapid currents quickly to remove any surplus of surface water.

In the area surveyed two distinct physiographic divisions are easily recognized—the lowlands or level country along the coast and large streams, and the uplands or rolling, broken country in the interior. These rolling uplands make up about three-fifths of the area, and are found at an average distance of about 5 miles from the coast. They extend to the northern boundary of the county and beyond. To the east and west they also pass beyond the limits of the county.

The topography of these uplands is very rolling and broken, there being scarcely any level country except to the east of Wiggins, where the area surveyed extends to and includes a few square miles of comparatively level country, known locally as the "Big Level." This level seems to be a remnant of the plateau as it appeared when first raised above the tides and before it had been so excessively carved by erosive agencies. It extends for an undetermined distance to the east, though it can not be far, since the valleys of the Pascagoula River and its western tributaries are not far distant. The elevation of the upland division varies considerably. The highest point of which any data could be obtained is at Bond, near the northern boundary of the area. Here the elevation above tide water is 306 feet. The lowest point given in the data at hand is at Nugent, and is only 84 feet above tide level. Along the southern border, where the uplands meet the coastal lowlands, the elevation is considerably less. The uplands do not exist as one continuous body, but are separated by the river lowlands into five different ridges or interstream areas, the largest being that between the Red and the Big Biloxi rivers and the smallest that between the Little Biloxi and the Big Biloxi rivers.

The soils of the uplands consist of sands and sandy loams, which are somewhat lighter to the north of the Big Biloxi River. Owing to

their elevation above the stream courses and to their uneven surface, they have excellent drainage. On some of the lighter soils it is excessive, the subsoil being of such a texture as to allow a rapid percolation of the meteoric waters to lower levels, leaving the surface deficient in moisture shortly after a heavy rain.

Numerous small streams are found during wet weather, but when drougthy conditions exist all but a few of the largest become dry. Springs are few and good drinking water scarce. Artesian water, it seems, can not be easily secured, as there is but one such well in the upland section, that being at the sawmill at Lyman, toward the southern border.

The lowlands may be considered in two divisions: First, the flat coastal section; second, the bottoms along the larger streams.

The coastal lowlands have a level or slightly undulating surface. They extend not only across the entire southern portion of Harrison County, but also across all three of the coast counties of the State. This level country extends inland about 5 miles. At Gulfport the elevation is 25 feet, while in the vicinity of the mouth of Wolf River, Bay of Portage, and the lower course of the Tchula River quite extensive areas lie at about tide level and consist of low, level, and marshy bottoms covered with vegetation peculiar to salt marshes. It will thus be seen that the elevation of the coastal section varies from sea level to about 25 feet, the higher portion lying along the coast.

The southwestern corner of the county is indented by the Bay of St. Louis. This indentation, with the Bay of Portage, forms a peninsula about 4 miles long by 2 miles wide, on which Pass Christian is located.

The southeastern corner of the county is indented to a more marked extent by the Back Bay of Biloxi. This arm of Mississippi Sound cuts into the land in a northerly direction, then abruptly turns to the west and extends for a distance of nearly 10 miles. It varies in width from three-fourths of a mile at the Biloxi toll bridge to nearly 2 miles at its western end. The peninsula formed by this indentation is nearly 2 miles wide, the city of Biloxi being located at its eastern end. From the fact that streams flowing into these two indentations have their sources near each other and that the country inland lying between them is lower than that along the coast, it may be inferred that at some former time they were connected, making of the present coast country a long, narrow island. The streams have built up the land, joining the island to the mainland and separating the two arms of the sea, by the deposition of sediments, which process is still going on in the Back Bay of Biloxi and the Bay of St. Louis.

The soils of the coastal lowlands are fine sands. The inland portion, as stated, is somewhat lower, and the sands are finer and more silty than those along the coast.

The drainage of this subdivision of the lowlands is fairly good, except for local low places and some of the finer sands inland, as well as the low, marshy places previously mentioned. The only good water for domestic use is secured by drilling artesian wells. An excellent and abundant supply can always be obtained at depths ranging from 675 to 925 feet, the wells always flowing.

The river lowlands occur in more or less narrow strips along the Wolf, Tchula, Red, Little Biloxi, and Big Biloxi rivers, Oakchambula Bayou, Cabawfa Creek, and a few of their tributaries.

Although the topography of these lowlands is similar to that of those along the coast in that it is level or slightly undulating, the elevation is widely different. Along the lower courses of the streams, where they emerge from the rolling upland, the elevation is about the same as that of the coastal lowland, the streams being navigable for schooners for short distances inland. In the vicinity of Wortham, along the Big and Little Biloxi rivers, it is about 65 feet, while it increases gradually as the streams are ascended. Near Perkinson, on the Red River, it is about 110 feet. The streams have cut deep channels through these lowlands, thus giving a better drainage than might naturally be expected. This fact tends to show that a second elevation has taken place and that the streams are endeavoring to reach their new base level.

The geological formations in Harrison County, from which the soils are derived directly by processes of weathering and erosion, are, in the upland portion of the county, the Lafayette of Quaternary time, consisting of unconsolidated reddish, gray, and yellow sands and clays, and in the lowlands the more recent sediment.

In many places in the Lafayette iron concretions and crusts have been formed by the oxidation of the infiltrating iron salts. Small, iron-stained quartz gravel is quite generally scattered over the surface of this formation, in a few places forming beds indicating swifter currents in some portions during the deposition of this material. Scattered through the central and northern parts of the county are small areas of fine wind-blown sand. The largest of such areas is about 2 miles east of Howison, where the sand is about 20 feet deep and rests directly upon the heavier material of the formation.

There is some evidence that the Port Hudson deposits outcrop in the vicinity of the Wolf River, but as the soils do not seem to be influenced thereby they will not be discussed here.

The lowlands previously described consist of fine sands and silt, or the recent deposits of alluvium. They belong to the latest of the Quaternary deposits—the Columbian. The term “Biloxi Sands” has been proposed for this division of the Columbian in this region.

SOILS.

There were recognized and mapped in the Biloxi area five soil types, exclusive of Meadow. The area and proportionate extent of each of these types are shown in the table given below:

Areas of different soils.

Soil.	Acres.	Per cent.	Soil.	Acres.	Per cent.
Norfolk fine sandy loam	171,968	43.6	Meadow	17,600	4.5
Norfolk sand	76,032	19.3	Orangeburg fine sandy loam	3,008	.8
Norfolk loam	68,416	17.4			
Norfolk fine sand	56,896	14.4	Total	393,920	

NORFOLK FINE SANDY LOAM.

The Norfolk fine sandy loam is the most extensive of the soil types mapped in the Biloxi area. The surface soil for the first 8 to 12 inches consists of a mealy gray fine sandy loam. In some localities it contains iron concretions and quartz gravel, thus giving it the local name of "buckshot" land. Near the border between this type and the Norfolk sand the soil is more sandy than in the typical areas, and the two types gradually merge into each other.

The subsoil of this type to a depth of 36 inches is a yellowish or reddish friable sandy clay. Some areas of it grade into a stiffer mottled clay at about 30 inches, while there are local spots where the subsoil is more nearly a heavy sandy loam.

The Norfolk fine sandy loam is found in all parts of the area surveyed. The largest areas occur east and west of the Wolf River, in the vicinity of Nugent, Lyman, Millview, and many other places along the Gulf and Ship Island Railroad. A large area is also found east of Wool Market, and many scattered areas are seen elsewhere throughout the county.

This soil type occupies the gently rolling, rolling, and even hilly areas of the upland portion of the area. The broad, rolling areas are very well situated for farming purposes. The steeper slopes occupied by this type are found in the northern part of the area surveyed, where the small streams have their sources. However, none of this soil is so rolling as to prevent successful cultivation. The elevation of the areas of this soil type ranges from 25 to 306 feet above sea level.

The drainage of the type is very good. The rolling character of the surface gives it good superficial drainage, while the friable character of the subsoil is such that underdrainage is quite free. It is seldom necessary to use ditch or tile drains in the areas of this soil type.

The Norfolk fine sandy loam owes its origin to the weathering of the yellow sandy clays of the Gulf Coastal Plain. The action of rain

water has taken quite a large amount of clay from the surface soil, leaving it with a higher percentage of sand than the underlying subsoil stratum. This type is developed largely by erosion, and near the small streams the surface soil is usually more sandy, showing that the fine material has been washed out and carried away. In a few places the entire sandy mantle of the surface soil has been eroded, leaving the sandy clay or stiff, mottled clay exposed.

Only a very small proportion of the Norfolk fine sandy loam is cultivated, the greater part of it being forested with a scattering growth of longleaf pine. From about two-thirds of the type the merchantable timber has been cut. The remaining one-third is still heavily timbered and in some places extensive turpentine orchards are seen. The areas cleared and cultivated produce only ordinary yields of corn, oats, cotton, and sugar cane, but good yields of potatoes, garden vegetables, and fruits. The few peach orchards seen on this type show that the soil is admirably adapted to the growing of this fruit on a commercial scale. Figs, pecans, plums, and pears are also successfully grown. Blackberries and strawberries do well. Sugar cane and some of the grasses make a fair growth in this soil, but the production of these crops is recommended only to supply home needs or local trade. Cotton produces from one-third to two-thirds of a bale per acre.

While the Norfolk fine sandy loam is not a typical general farming soil, it is well adapted to the growing of peaches, small fruits, berries, and tomatoes, and to the production of late truck. Pears do well, although they soon blight. This soil is worth from \$3 to \$15 an acre, depending on distance from the towns and railroad facilities.

Below are given the mechanical analyses of the Norfolk fine sandy loam:

Mechanical analyses of Norfolk fine sandy loam.

No.	Locality.	Description.	Gravel, 2 to 1 mm.	Coarse sand, 1 to 0.5 mm.	Medium sand, 0.5 to 0.25 mm.	Fine sand, 0.25 to 0.1 mm.	Very fine sand, 0.1 to 0.05 mm.	Silt, 0.05 to 0.005 mm.	Clay, 0.005 to 0.0001 mm.
			P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.
10733	1 mile NE. of Wool Market.	Fine sandy loam, 0 to 10 inches.	1.6	8.2	15.5	21.5	22.2	24.8	6.1
10731	3 miles NE. of Wiggins.	Fine sandy loam, 0 to 12 inches.	.2	.6	1.4	28.8	27.1	34.9	7.1
10729	1½ miles SW. of Howison.	Fine sandy loam, 0 to 10 inches.	.5	1.4	1.9	23.9	28.2	36.2	7.9
10901	11 miles NW. of Pass Christian.	Fine sandy loam, 0 to 12 inches.	.7	2.6	6.4	37.5	23.7	20.4	8.6
10732	Subsoil of 10731	Yellow sandy clay, 12 to 36 inches.	.1	.4	1.1	25.5	24.1	31.1	17.6
10734	Subsoil of 10733	Yellow sandy clay, 10 to 36 inches.	2.2	5.6	11.1	14.8	14.7	30.5	20.8
10902	Subsoil of 10901	Sandy clay, 12 to 36 inches.	.3	1.6	4.4	30.3	22.2	16.4	24.6
10730	Subsoil of 10729	Sandy clay, 10 to 36 inches.	.3	1.0	1.0	18.3	24.7	28.0	26.5

NORFOLK FINE SAND.

The surface soil of the Norfolk fine sand, to a depth of 8 or 10 inches, consists of a grayish or whitish sand of fine texture and loose, incoherent structure, composed of well-rounded particles. In a few depressed areas where decayed vegetation has accumulated there is quite a little organic matter, but the greater proportion of the type has only a very small percentage.

The subsoil to a depth of 36 inches is yellowish or grayish fine sand, also loose and incoherent. Both the soil and subsoil in some localities contain a high percentage of medium sand. At from 3 to 6 feet this sand grades into a fine white sand, which, along the coast, has a depth of from 20 to 50 feet.

The Norfolk fine sand reaches its greatest development in a large unbroken area extending across the southern part of the county along the Louisville and Nashville Railroad. It borders Mississippi Sound and extends inland to the north for a distance varying from 3 to 5 miles. Many other areas of less extent are found in the vicinity of Lazarus, Lorraine, Landon, Delisle, and to the north of Cuevas, while a small area is mapped about 2 miles east of Howison, and also a spot near Finley.

The surface characteristics of the Norfolk fine sand are very uniform throughout, constituting broad, level to gently rolling and undulating areas of country, whose elevation along the coast ranges from tide water to about 25 feet above. A higher altitude is reached by the areas farther inland, and the area east of Howison is about 175 feet above sea level. Throughout the areas of this soil there occur long, narrow depressions, more or less local, lying a few feet lower than the more typical surrounding areas of the type.

The more elevated and undulating areas of the Norfolk fine sand have very good natural surface drainage, due mainly to the open, loose texture of both soil and subsoil. It is the thoroughly drained condition of this type that makes it an early and warm soil, suitable for the production of truck. The depressions occurring in this type, referred to in connection with its topography, are not well drained, and in some cases have been mapped as Meadow. Some of these depressions could be drained by tile or open-ditch drains. Owing to the texture of this soil and its proximity to the water level, the moisture conditions are superior to those of any other type in the area except the Norfolk loam.

This type owes its origin to recent Coastal Plain deposits of fine sand, which represent the youngest geological formation of the area. Erosive agencies have done little to change the texture of this formation since it was first uplifted from the Gulf of Mexico. In fact,

the surface soil is slightly heavier than the subsoil, from the accumulation of the relatively small amount of vegetable matter which it contains; whereas in the types subjected to greater erosion the texture of the surface soil has usually been made more sandy than the subsoil through the removal of the finer particles in the wash. The area of Norfolk fine sand east of Howison consists of wind-blown sand and is underlain, at from 3 to 20 feet, by the materials of the Norfolk fine sandy loam.

The Norfolk fine sand is an ideal soil for early truck, and it is the trucking industry that is making this soil valuable in an agricultural way. Only a small proportion of this type is under cultivation, except in the vicinity of the Louisville and Nashville Railroad and to the north of Longbeach. The soil along the coast front is held at fancy prices, as well as that in the vicinity of the small towns, but the large areas lying north of the railroad can be bought for farming purposes at fairly reasonable prices. A few liveoaks and magnolias are seen on this type near the coast, while the longleaf pine and some pitch pines, together with the scrubby pines which have recently grown up, constitute the timber growth farther inland. The depressed areas are covered with cypress, gum, bay, and other hardwoods.

The crops grown on this type with the best results are radishes, lettuce, beets, cabbage, onions, cucumbers, green peas, turnips, melons, cantaloupes, strawberries, tomatoes in a small way, and early corn. Grass and sugar cane are grown where the land is heavily fertilized, but these crops are not recommended, except for home use. Figs and pecans do remarkably well on this soil, and several orchards were observed. A few peaches, plums, and pears were also seen, but these fruits are better adapted to the soils of the more rolling areas. In general, the Norfolk fine sand offers the best advantages for early truck growing of any type in the area surveyed, not alone because of its texture, but also of the favorable climatic conditions along the coast and the excellent transportation facilities.

Below are given the mechanical analyses of typical samples of the Norfolk fine sand:

Mechanical analyses of Norfolk fine sand.

No.	Locality.	Description.	Gravel, 2 to 1 mm.	Coarse sand, 1 to 0.5 mm.	Medium sand, 0.5 to 0.25 mm.	Fine sand, 0.25 to 0.1 mm.	Very fine sand, 0.1 to 0.05 mm.	Silt, 0.05 to 0.005 mm.	Clay, 0.005 to 0.0001 mm.
10893	½ mile E. of Pass Christian.	Gray fine sand, 0 to 10 inches.	P. ct. 0.1	P. ct. 4.2	P. ct. 12.6	P. ct. 57.6	P. ct. 7.7	P. ct. 14.9	P. ct. 2.6
10895	½ mile NW. of Gulfport.	Gray fine sand, 0 to 10 inches.	.2	2.1	17.0	68.4	2.0	7.7	2.7
10897	1¼ miles W. of Biloxi.	Gray fine sand, 0 to 8 inches.	.0	1.8	20.3	63.5	2.4	7.8	3.7
10898	Subsoil of 10897	Fine and medium sand, 8 to 36 inches.	.0	1.7	22.5	60.4	2.3	9.2	3.7
10894	Subsoil of 10893	Fine and medium sand, 10 to 36 inches.	.2	4.2	14.7	55.5	6.8	12.6	5.8
10896	Subsoil of 10895	Yellow fine sand, 10 to 36 inches.	.0	1.4	13.8	65.8	1.8	8.9	7.9

NORFOLK SAND.

The Norfolk sand, to a depth of 8 to 12 inches, consists of a gray or brown medium to coarse sand, rather loose and incoherent, and containing comparatively little organic matter. Some few areas of this soil are more nearly a fine to medium sand, being more coherent and compact than the typical occurrences. In some places a few iron concretions and fragments of quartz gravel are found in this soil, and a few small hills of rounded gravel occur.

The subsoil, to a depth of 36 inches, is a medium to coarse sand, loose and incoherent and of a reddish or grayish color. It also contains some quartz gravel. In many places the subsoil contains a sufficient amount of clay to cause it to be sticky and to cohere, and when exposed to the sun it bakes and has the appearance of a friable clay. In other instances the subsoil, below 30 inches, grades into a sandy clay. These places are near the boundary between this type and the Norfolk fine sandy loam.

The Norfolk sand occurs in broad, extended areas, running in a general north and south direction through the northern and central parts of the area surveyed. It is found most typically developed in the vicinity of Airey and McHenry, to the west of Ten Mile, around Wiggins, and along the Gulf and Ship Island Railroad. The largest area begins at Ten Mile, passes through Airey, and reaches the lowlands along the Biloxi River. Many smaller disconnected areas were also mapped in the northern and central portions of the county.

The surface features of the Norfolk sand are broken and varied. It occupies the hilly and very rolling areas with an elevation of from 150 to 306 feet, and the less rolling areas bordering a few of the stream courses and lowlands where the elevation ranges from about 90 to 130 feet above tide water. Around McHenry, Airey, Wiggins, and in a few other places the country is very rolling and hilly, constituting the roughest part of the area surveyed.

Owing to its rolling surface and the loose, open character of the subsoil the Norfolk sand has exceptionally good drainage. Indeed, drainage is so thorough and the rainfall seeps away so rapidly that the soil is soon deficient in moisture and crops are likely to suffer from lack of moisture even in ordinary seasons. All kinds of farm work can be carried on immediately after a rain. This soil is subject to serious erosion, and considerable care should be exercised in its management to prevent the surface soil from being washed away.

The Norfolk sand probably owes its origin to the weathering of the more sandy clays and sands of the Lafayette formation. The fact that the mineral particles of soil are coarser than the surrounding soil type indicates that it was deposited by swifter-flowing currents. The few beds of gravel were also deposited in the same way. Erosive agencies have played an important part in the formation of this soil by washing out the greater part of the clay and silt usually found in the materials of the Lafayette in this area.

Agriculturally speaking, the Norfolk sand is not a very productive soil. Until recently the greater part of this type was covered with a fairly good growth of longleaf pine, but at present most of the marketable timber has been cut and the area occupied by this soil presents a rather desolate appearance. A few small farms and here and there abandoned fields and cabins occur. The crops grown are: Corn, with a small yield; cotton, giving about one-third of a bale per acre; potatoes, sweet potatoes, berries, peaches, and all kinds of garden vegetables. The soil is too light for general farming purposes, but if heavily fertilized garden vegetables, peaches, plums, blackberries, potatoes, tomatoes, and melons do well in favorable seasons, and these crops are recommended. Some excellent gardens were seen.

The Norfolk sand is an early and easily tilled soil and one which can be readily improved by adding organic matter in some form, as by turning under some leguminous crop or by applying decaying pine needles, which may be had in large quantities. These substances make the soil more loamy and more retentive of moisture.

Much of the Norfolk sand can be bought for \$1 an acre or less, but the better portions are held at from \$3 to \$5 an acre, depending on location. These prices only apply to land from which the merchant-

able timber has been cut, as the timber lands are worth from \$10 to \$25 an acre.

The following table gives mechanical analyses of the Norfolk sand:

Mechanical analyses of Norfolk sand.

No.	Locality.	Description.	Gravel, 2 to 1 mm.	Coarse sand, 1 to 0.5 mm.	Medium sand, 0.5 to 0.25 mm.	Fine sand, 0.25 to 0.1 mm.	Very fine sand, 0.1 to 0.05 mm.	Silt, 0.05 to 0.005 mm.	Clay, 0.005 to 0.0001 mm.
			<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>
10633	1 mile E. of Wiggins.	Fine and medium sand, 0 to 12 inches.	0.3	3.1	15.2	52.6	10.5	12.7	5.6
10903	1 mile S. of McHenry.	Medium to coarse sand, 0 to 9 inches.	1.5	35.3	30.0	10.6	4.3	12.2	6.1
10635	2½ miles W. of Per- kinston.	Gray medium sand, 0 to 9 inches.	.3	6.7	25.4	38.3	6.1	16.3	6.9
10904	Subsoil of 10903 -----	Medium to coarse sand, 9 to 36 inches.	3.2	36.7	26.2	10.0	4.8	13.7	5.0
10636	Subsoil of 10635 -----	Medium loamy sand, 9 to 36 inches.	1.6	6.4	23.8	34.5	5.2	16.5	11.7
10634	Subsoil of 10633 -----	Brown medium clayey sand, 12 to 36 inches.	.3	3.7	16.7	49.9	6.8	8.5	14.2

NORFOLK LOAM.

The surface soil of the Norfolk loam consists of a gray fine to very fine sand and silt, containing considerable organic matter and having a depth of 8 to 10 inches. The relatively high percentage of very fine sand and silt is very noticeable in the field, giving the soil a mealy, velvety texture. In addition to the typical areas of this soil there are a few spots scattered here and there which are more nearly a clay loam. These places, however, occur in such a way that they could not be separated from the fine sandy loam under existing conditions. There are also a few areas where the soil is yellow fine sand to a depth of 36 inches or more, but these were too small to be shown as a separate type on a map of the scale used.

The subsoil of the Norfolk loam to a depth of 36 inches is a yellowish to grayish fine to very fine sand and silt. In a few places the fine sandy loam grades into a mottled, sticky, sandy clay at from 24 to 30 inches, and the clay loam areas of the soil are underlain by a dark clay or loam.

The Norfolk loam occurs in large unbroken areas of very irregular outline along Red, Little Biloxi, Big Biloxi, and Wolf rivers, and to the west of Landon. Many smaller areas and narrow strips are found elsewhere throughout the area surveyed, especially near the bayous and the depressed places in the Norfolk fine sandy loam.

The surface features of this type are very uniform throughout, as

it occupies the low, level areas between the Norfolk fine sand and the rolling uplands and the extended areas of flat land along the stream courses. In a few instances it is found as second bottom land or terraces, lying a few hundred yards from the more recent bottom lands. The elevation of this type above tide water varies considerably. At the mouths of the rivers and to the west of Landon it rises only a few feet above sea level, while farther north it reaches an altitude of 180 feet above tide water.

Part of this type has fairly good natural surface drainage, but the more level areas west of Landon and near the bayous are so flat in many places that the surface water runs off very slowly. Such areas would be greatly benefited by open-ditch or tile drains. The areas lying along the Big and Little Biloxi and Red rivers are fairly well drained, as the country gradually slopes southward. The streams have cut deep, wide channels, and small open furrows would be sufficient to carry off the surplus rain water. This land is overflowed only during unusually heavy rains.

The Norfolk loam is largely of alluvial origin. The streams having their headwaters in the areas of Norfolk sand and Norfolk fine sandy loam have brought down considerable quantities of fine sand and silt and deposited this material during periods of flood waters. The dark-gray and blackish color of this soil is due to the organic matter laid down in the floods or added by decaying vegetation. The heavier phases probably owe their origin to the fact that in the bends of the rivers the backwater from the slow-moving currents has deposited a greater amount of clay and silt than was deposited in the swifter flowing currents on the opposite side of the stream.

As yet none of the Norfolk loam is under cultivation. It is covered for the most part with pine, gum, cypress, oak, and magnolia, and some other hardwoods. The greater part of this type can be cleared and made ready for cultivation at a nominal expense, although not quite so cheaply as some of the upland soils. While no crop yields can be given, it is safe to say that this soil is naturally one of the most productive in the area surveyed. It could be very easily tilled, and also possesses favorable moisture conditions. Judging from its texture and its use in other areas, this type will produce good corn, oats, grass, sugar cane, cabbage, watermelons, cucumbers, and late truck.

The analyses of the following samples give the texture of the Norfolk loam:

Mechanical analyses of Norfolk loam.

No.	Locality.	Description.	Gravel, 2 to 1 mm.	Coarse sand, 1 to 0.5 mm.	Medium sand, 0.5 to 0.25 mm.	Fine sand, 0.25 to 0.1 mm.	Very fine sand, 0.1 to 0.05 mm.	Silt, 0.05 to 0.005 mm.	Clay, 0.005 to 0.0001 mm.
10883	4 miles W. of Wiggins.	Gray fine sandy loam, 0 to 9 inches.	P. ct. 0.1	P. ct. 0.9	P. ct. 1.6	P. ct. 28.4	P. ct. 35.1	P. ct. 26.9	P. ct. 7.0
10885	1 mile NE. of Wortham.	Gray fine sandy loam, 0 to 9 inches.	.2	.4	.3	9.7	32.9	46.5	9.7
10884	Subsoil of 10883	Yellow fine sandy loam, 9 to 36 inches.	.1	.6	4.4	24.7	29.8	27.5	12.7
10886	Subsoil of 10885	Silty and fine sandy loam, 9 to 36 inches.	.1	.2	.2	7.6	28.3	48.0	15.6

ORANGEBURG FINE SANDY LOAM.

The Orangeburg fine sandy loam, locally spoken of as the "big level land," consists of a brownish heavy sandy loam of rather fine texture to a depth of 8 inches. The subsoil, from 8 to 36 inches, varies from a red loam to a friable sandy clay of reddish color containing quite a high percentage of fine sand particles. It occasionally happens that the red sandy clay grades into a reddish sticky sand at 30 inches. There are a few spots of this type where the soil acts like a loam and others where the surface material is quite sandy. The type as a whole contains a slightly greater amount of organic matter than the other upland soils, and also more than is usually found in this type of soil in other areas.

The development of the Orangeburg fine sandy loam in the present survey is very limited. The two main bodies are found in the vicinity of Wisdom and about 2 miles north of that place, while a few small scattered spots occur in the northern part of the area.

The surface features of the Orangeburg fine sandy loam are very uniform throughout. It occupies broad, level, and gently rolling areas, which have an average elevation of about 200 feet above tide water. It lies somewhat higher than the immediately surrounding soil types and covers the flat top of the interstream area of country lying between Flint Creek and the tributaries of Black Creek, just east of the present survey.

This type, although level or gently rolling, has good natural surface drainage, a feature due to its elevated position and the friable character of the subsoil. Any of the more level areas can be easily drained by means of open ditches.

The Orangeburg fine sandy loam is probably derived from the weathering of the red sandy clays of the Lafayette formation.

A few farms on the Orangeburg fine sandy loam have been in operation since the interior of the country was settled. Proportionally more of this type is under cultivation than of any other soil in the area, although the greater part of it has been covered until recently with an excellent growth of longleaf pine. This timber is rapidly being cut.

Some of the best farms in the northern part of the county are located on the Orangeburg fine sandy loam, and this section is more of an agricultural community than any other part of the interior of the county. This soil is recognized as the most productive of the upland types. Corn, oats, cotton, sugar cane, potatoes, garden vegetables, peaches, and small fruits are successfully grown. Sugar cane does well for one or two years, but after that time only a moderate yield can be secured without heavy applications of manure. Cotton does fairly well, averaging from one-half to two-thirds of a bale per acre. This type seems to be a good soil for peaches, small fruits, pecans, figs, and berries, and also for pears, but the pears blight within a few years. For general farming purposes the Orangeburg fine sandy loam is the best of the upland soils.

Below are given the mechanical analyses of samples of the Orangeburg fine sandy loam:

Mechanical analyses of Orangeburg fine sandy loam.

No.	Locality.	Description.	Gravel, 2 to 1 mm.	Coarse sand, 1 to 0.5 mm.	Medium sand, 0.5 to 0.25 mm.	Fine sand, 0.25 to 0.1 mm.	Very fine sand, 0.1 to 0.05 mm.	Silt, 0.05 to 0.005 mm.	Clay, 0.005 to 0.0001 mm.
10629	$\frac{1}{2}$ mile N. of Wisdom.	Brown fine sandy loam, 0 to 8 inches.	P. ct. 0.1	P. ct. 3.7	P. ct. 10.5	P. ct. 31.6	P. ct. 13.2	P. ct. 26.2	P. ct. 14.7
10631	3 miles N. of Wisdom	Brown fine sandy loam, 0 to 8 inches.	.4	5.4	11.6	25.2	12.1	29.6	15.6
10630	Subsoil of 10629	Red heavy loam, 8 to 36 inches.	.2	2.5	7.7	28.9	11.0	23.3	26.4
10632	Subsoil of 10631	Red clay, 8 to 36 inches...	.3	3.9	9.0	20.9	9.0	25.3	31.5

MEADOW.

The areas mapped as Meadow in this survey consist of low, flat, wet land occurring at the heads of bayous and along the rivers and small streams. The soil varies from a silty loam to a fine sandy loam containing quite a high percentage of organic matter. The subsoil is usually somewhat heavier in texture than the soil, though frequently it is a fine sand or sandy loam. There are two phases of this Meadow

soil. One is the marsh land at the mouth of the Wolf River, on the Bay of Portage, and at the head of Back Bay; the other is composed of the narrow strips found along the small streams.

The largest bodies of Meadow occur in the vicinity of Delisle and near the Bay of Portage, with similar and smaller areas at the head of Back Bay; while the largest areas found along the small streams lie north of the Wolf River and in the neighborhood of Nugent.

This soil occupies the lowest position of any type in the area. The marsh areas of it are only from 1 to 3 feet above tide water, and are inundated during storms on the coast. The narrow strips are flat, but not so uniformly level as the marsh areas. It is impossible to drain the latter on account of their low elevation above tide water, but the small bodies of this type throughout the interior of the county can be easily drained by means of open ditches or by opening and enlarging the present channels of the streams.

The Meadow owes its origin to the deposition of sediment during high waters and to the wash from the adjoining uplands. Frequently leaves, pine straw, and branches of trees are caught and buried in this wash along the streams, and their decay has in some places charged the soil heavily with organic matter.

As yet none of the Meadow is under cultivation. The marsh areas are covered with a dense growth of water-loving grasses, characteristic of salty conditions. The narrow strips along the small streams are forested to gum, cypress, poplar, oak, and other hardwoods, which as yet are of little commercial use. If these strips were cleared and cultivated it is believed they would prove to be by far the most productive lands in the area, as they are made up of heavy-textured soil, containing considerable organic matter, and possessing a moisture supply sufficient to resist droughts. Corn, oats, sugar cane, and grasses would do well on this Meadow land. It would also make excellent pasture.

On account of the wet nature of this type no samples were collected.

AGRICULTURAL CONDITIONS.

Although Harrison County was settled nearly two hundred years ago, but little attention has been given to the advancement of agricultural interests, and as a consequence the area is but sparsely inhabited. Until recently it was one vast forest of longleaf pine, and at present lumbering, turpentine distilling, and charcoal burning are the important industries throughout the interior of the area surveyed, while the catching of fish and oysters is the chief pursuit of those living along the coast. During the last two years the truck-

ing industry along the Louisville and Nashville Railroad and to the north of Longbeach has acquired some little importance.

The farming class in the Biloxi area have not made great progress in the agricultural development of their country, and have given their attention largely to raising hogs and other live stock on the open range, while drawing an income from the valuable forests of pine that covered so large a part of the county. Many, settling here and there in the pines, obtained the land from the Government at a small cost, and the returns from the sale of timber—all clear profit—and from turpentine and charcoal have provided an easy living. Occasionally a good farmhouse is seen, neatly painted and fenced in, and near this usually a fairly good barn for a warm climate. The majority of the farmhouses, however, are small frame or log houses with from one to three rooms and with a chimney built of mud held together by sticks. Such places seldom have barns worthy of the name. Along the coast the farm buildings are better, and the surroundings show considerably more thrift and activity than farther in the interior.

The small amount of cleared land is tilled chiefly by the owners themselves. Occasionally the land is rented, and in such cases the tenant pays a certain part of the crop produced. There are only a few places in the area where the land is properly cultivated, the best example being seen on the truck farm north of Longbeach, which is operated by a firm—the pioneers in commercial truck growing in the area.

The farms in the southern part of the county vary in size from a few up to 100 acres, while those of the interior probably average about 160 acres. The average size of farms for the whole county, according to the Twelfth Census, is about 125 acres. It must be understood, however, that less than one-seventh of the county is included in farms, the remainder being held in large tracts by lumbering corporations. A conservative estimate of the proportion of land under cultivation in the area surveyed would probably place it at less than 5 per cent, exclusive of gardens immediately surrounding the houses. A farm of 160 acres in most instances will not have more than one small patch or field under cultivation, and in many sections in the interior of the area no farming whatever is carried on.

Throughout the southern part of Mississippi, and especially along the coast, labor for farm work is very scarce. Most of the field work is performed by the owners of the land and their immediate families. The lumber and fishing interests can afford to pay higher wages than the farmers, and these lines of industry absorb the greater proportion of the available labor. The negroes prefer to work around the saw-

mills, turpentine stills, and docks rather than in the fields. Wages for all grades of farm work are rather high, and the laboring man can easily make a living.

As before mentioned, lumbering, turpentine distilling, charcoal burning, and the catching of fish and oysters are the chief industries of the area. The greater part of the farming is done in the coast section of the county, and here the trucking industry assumes its greatest proportions. Such crops as lettuce, radishes, cucumbers, beets, cabbages, beans, potatoes, sweet potatoes, watermelons, and cantaloupes are most successfully grown. Figs of the Celeste and Black varieties and pecans are grown to a considerable extent along the coast and to a limited extent in the northern part of the area. Corn, oats, cotton, sugar cane, garden vegetables, and peaches are raised chiefly on the uplands. Plums do well, and pears also, except for their early blighting. Quite a number of cattle and sheep are raised, these running at large on the range the entire year. Spring lambs can be put on the market very early in the season. Much wool is produced annually. Peach growing is in its infancy, but promises to be one of the important industries of this section. Poultry raising and dairying would also be paying industries, as local prices for these products are very high throughout the year.

To recapitulate the salient crop values of the soil types of the Biloxi area, the Norfolk fine sand is undoubtedly the best for early truck. Pecans and figs are also well adapted to it. The moisture conditions in some places are quite favorable, and lying, as it does, along the railroad, the facilities for shipping truck to the northern markets are very good.

The Norfolk loam would probably be one of the most productive soils in the area surveyed, but as yet none of it is under cultivation. Its surface conditions would permit it to be cultivated with machinery. This soil would produce fairly good yields of corn, oats, cotton, grasses, and sugar cane.

The Norfolk fine sandy loam is farmed to corn, oats, cotton, sugar cane, and garden vegetables. A few peaches, pecans, and figs are also grown. The clayey subsoil of this type makes the effect of manuring more lasting than on any other soil type in the area; the same characteristic improves the type as regards moisture supply in dry periods.

The Norfolk sand, owing to its texture and free drainage, is a warm, early soil, and one which, with heavy applications of manure and abundant rainfall, will produce fairly good yields of truck and berries. It suffers seriously from drought, even during ordinarily dry seasons, and is not suited to general farming purposes.

The Orangeburg fine sandy loam, locally known as the "Big Level," is the best general farming land in the area surveyed, and was so recognized by the early settlers of the county. It produces fairly good yields of cotton, oats, corn, sugar cane, garden vegetables, and fruits.

As a rule, the soils of the area are deficient in organic matter. Large quantities of pine needles could easily be obtained as litter for the stables and barnyards, and these would not only act as an absorbent, but in their decay would add considerably to the humus content of the soil. Even the pine straw alone would be of some value to the soils. Leguminous crops, such as clover and cowpeas, if plowed under, would add nitrogen to the soil. Both the texture and moisture conditions of these sandy soils could be easily improved to a certain extent by the above methods. By a special arrangement of the Louisville and Nashville Railroad Company a considerable quantity of stable manure is shipped in car lots from New Orleans to the truck growers along the coast. This manure can be secured at the nominal rate of \$10 a car delivered.

The area surveyed is very well situated as regards transportation facilities. The main line of the Louisville and Nashville Railroad crosses the southern portion of the county. Freight schedules average forty-five and fifty-six hours to Cincinnati and Pittsburg, respectively. Ventilated and refrigerator cars are used for shipping the truck. Lettuce, radishes, beets, cabbages, onions, etc., in carload lots, can be shipped to these places, for instance, at a cost of from \$70 to \$115 a car. The Gulf and Ship Island Railroad runs north from Gulfport through the area surveyed. This road handles the lumber from the interior.

The dirt roads of the area are in poor condition, but are probably as good as can be expected in a new, undeveloped country. They are seldom worked, and run in almost any direction, dodging around pines and gullied places. The streams in the interior of the county are bridged here and there, but the bayous and rivers in the southern part are crossed by means of ferries, and the ferriage charges are high. Cheaper rates and more bridges owned by the county would do much to attract settlers to the area.

While there are no large cities in the area surveyed, Biloxi, Gulfport, Pass Christian, McHenry, and Wiggins offer excellent markets for part of the products of the area. The greater part of the truck is sent to Louisville, Cincinnati, Pittsburg, and other northern points. About 50 carloads of truck were shipped from the area during the spring of 1904. Shipments of these products will probably increase rapidly from this time on, as the trucking industry is only in its infancy. Gulfport has quite a good harbor, and many ocean steamers

enter that port. Millions of feet of lumber are exported annually, and the town is developing rapidly. There is a canning factory for fruits and tomatoes at Wiggins and also one at Perkinston. The only cotton gin in the area is located at Wiggins. About 30 bales of cotton were handled there during the last season. Quantities of fish and oysters are each year shipped from Biloxi and Pass Christian.

Speaking generally, the future agricultural development of the Biloxi area lies in the production of early truck—for northern shipment—small fruits, peaches, figs, and pecans.

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